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A PRELIMINARY CENSUS OF THE PLANT DISEASES OF SOUTH-WESTERN AUSTRALIA.

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With the Author's Compliments.

A Preliminary Census of the Plant Diseases of South-Western Australia.

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Records of the occurrence of plant diseases in Western Australia are scattered through various publications. The present paper is an attempt to bring them together, with a number not previously published. It is hoped that it may serve as a contribution to a census of the plant diseases of Australia.

The most comprehensive list of diseases recorded as occuring in Western Australia published up to the present time is to be found in McAlpine's Systematic Arrangement of Australian Fungi, 1895. The writer has, however, considered it advisable to omit some of the references therein given, while others have been somewhat doubtfully included. These remarks apply to important diseases of economic plants which are unknown to the field officers of this Department and to the writer. If they do occur they are certainly not of economic importance in this State. Such diseases include Apply Scab (*Venturia inequalis*), Leaf Rust of Wheat (*Puccinia triticina*), etc. Records in early publications of the Department of Agriculture are also omitted where they do not bear evidence of reliable identification, unless the diseases have been personally seen by the writer. It may, therefore, be stated that all diseases listed and not rcorded by recognised authorities have been seen by him. Where no authority is quoted the record is apparently a new one.

The list does not pretend to be exhaustive, and several known diseases, not yet determined with any certainty, have been omitted. It is intended to publish additional records from time to time. An attempt has also been made to indicate appromimately the season of occurrence and the relative importance of the diseases of economic plants.

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SOUTH-WESTERN AUSTRALIA.

The area under consideration practically covers that designated as Swanland by Professor Griffith Taylor. The South-West being a term used in several senses, for clearer definition the area referred to will be called Swanland in this paper. It forms a triangular area extending from the Murchison River to a little East of Esperance. The base of the triangle is formed by the 10 inch isohyet, the other two sides to West and South being bounded by the ocean. This base line represents roughly the Eastern limits of Agriculture. Though outside the area, places, such as Kalgoorlie, on the Goldfields Water Scheme are included in respect to the diseases of cultivated plants.

CLIMATE AS AFFECTING THE OCCURRENCE OF DISEASES.

The climate of Swanland has been well described by Professor Griffith Taylor* in general terms. More detailed information is to be found in articles by W. Catton Grasby† with particular application to the area south of Perth and west of the Great Southern Railway.

The climate is of the Mediterranean type. The summers are warm and dry, the winters mild and the rainfall practically confined to the cooler months of the year. "The rainfall is the least variable in Australia. Hence it is possible to grow wheat with a lower average rainfall than elsewhere, especially as the rain falls just in that season when it is most required."* The variation of the annual rainfall from the average rarely reaches 10 % between Perth and the Leeuwin. From Geraldton to the extreme South-Easterly point the variation for some distance from the coast does not exceed 15 %, while over the whole area, including the Eastern Wheat Belt, the rainfall does not vary more than 20 %. The maximum falls occur on the average in June and July. The average annual falls vary from about 50 inches in the extreme South-West to 10 inches on the eastern boundary of the area. The summer rainfall is erratic, but is never great, averaging about 8 % to 10 % of the total fall during the period November to March, with a variation of 6 % to 17 % according to locality, the greater percentage occurring in the extreme South-West. Fruit trees and vegetables are grown principally between the 25 inch isohyet and the sea, while sown pastures and miscellaneous summer crops extend to about the 20 inch isohyet. The principal cereal areas are between the 25 inch and

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* Griffith Taylor, The Australian Environment. Advisory Council of Science and Industry. Memoir 1. Melbourne, 1918.

† W. Catton Grasby. The Climate of the South-West. "Western Mail," Perth, 10th July, 1924. Also Handbook and Guide to W.A. Govt. Printer, 1914, pp. 28-30.

10 inch isohyets, though oats and to a lesser extent wheat are grown under the higher rainfalls. As regards temperatures, the summers are hot, the maximum temperatures rising northwards and eastwards. The nights are usually cool. The south or south-easterly summer sea breezes which arise about midday on the coast and eventually carry their effects 150 miles or so inland are a great aid to human comfort. In the South-West the nights in summer may be quite cold, especially away from the coast. (See records for the summer of 1924 at Bridgetown under Apple Bitter Pit.) There is a distinct absence of mugginess except on rare occasions in the summer. The winters are mild. Damaging frosts are rare towards the coast. Further east the frosts are more severe, but there crops such as fruits and vegetables which are likely to suffer are not largely grown.

In so far as the capital cities may be taken as representative of their several States, comparisons are interesting. It will be noted in the following tables compiled from the Commonwealth Year Book that Perth has more hours of sunshine and fewer rainy days in the summer (November-March), and ranks second to Adelaide in lowness of summer humidity.

RELATIVE HUMIDITY (%) OF SUMMER MONTHS.*

Mean Daily Highest Readings.

	Perth.	Adelaide.	Melbourne.	Sydney.	Brisbane.
November	63	57	69	79	72
December	62	50	69	77	68
January	61	59	65	78	79
February	65	56	69	81	82
March	66	58	71	85	85
Average for 5 summer months	63	56	69	80	77
Mean 9 a.m. readings	54	41	60	70	67

AVERAGE NUMBER OF RAINY DAYS.*

	Perth.	Adelaide.	Melbourne.	Sydney.	Brisbane.
November to March	19	28	43	68	65
April to October	100	95	93	88	64
Total	119	123	136	156	129

* Compiled from Official Year Book. Commonwealth of Australia. No. 16. Melbourne, 1923.

AVERAGE YEARLY HOURS OF SUNSHINE.*

	Perth.	Adelaide.	Melbourne.	Sydney.	Brisbane.
November to March	1,476	1,380	1,245	961	1,107
April to October ..	1,111	1,063	1,161	1,328	1,458
Total	2,586	2,443	2,406	2,289	2,565

From the point of view of plant growth the year may be conveniently divided into two periods, the dry and the wet. The latter may be divided again into autumn, winter, and spring.

Dry: Summer—November to March.
Autumn—April and May.

Wet: Winter—June, July, and August.
Spring—September and October.

The foregoing is only approximate, as the wet season may commence or conclude earlier or later by several weeks, thus not only affecting to some extent the whole length of the wet season, but considerably altering the length of the autumn and spring portions. The dry season, except perhaps in the extreme South-West, has no dependable summer rain. What does occur is in the form of thunderstorms, which are erratic and more or less local and short-lived. They may do more harm than good to plant growth by stimulating the germination of the seeds of annual plants, which shortly after fail from lack of moisture, and thus reduce the possible autumn germination of herbaceous plants. The summer season is responsible for plant troubles, which are primarily those of water supply. These are to be found in stunted growth, dropping of leaves, dieback of younger growth, etc. Troubles due to excess of sodium chloride, sodium and magnesium sulphate are also more marked towards the end of summer, as these salts become concentrated by capillarity and evaporation in the surface layers of the soil. The drying effects of strong east winds and the mechanical effects of the same winds when sand-laden, must also be here included. Close to the coast the salt-laden summer sea breezes ("Doctors," as they are usually called, as "Fremantle Doctor," "Geraldton Doctor") have a marked detrimental effect on exposed plants. This effect also results from the strong south-west winter blows. The occurrence of cool nights approaching freezing point in the summer in the South-West may be associated with the development of Bitter Pit in apples. Summer rains at critical periods may cause cracking of ripening fruits, e.g., apples, grapes, oranges. With citrus fruits the same result may occur with the opening

* Compiled from Official Year Book. Commonwealth of Australia. No. 16. Melbourne, 1923.

of the wet season in orchards which have not had, naturally or by irrigation, sufficient moisture during the summer. It is possible that similar causes associated with poor gravelly soils are connected with the occurrence of Exanthema of citrus. Another trouble, associated apparently with rapid changes of water supply, is the Blossom-end Rot of tomatoes, which occurs on light soils. Delicate plants grown in sandy soils may be injured owing to the heating of the sand by the sun.

As regards parasitic diseases attacking above ground parts, few occur primarily in the summer. The majority then found may be traced back to infection in the wet season. It is interesting to note here the effect of the sea breezes on the atmospheric humidity. Almost every day in summer a breeze commences at the coast about midday, and finally makes itself felt upwards of 150 miles inland. It is accompanied by a rise in humidity, so that readings show a general increase at Perth from midday to midnight, and then fall again. Its arrival in the wheat belt results in a toughening of the straw of the crop, and in reducing the efficiency of harvesting machinery, frequently requiring a cessation of work. Nevertheless, this increase in humidity coincident with high temperatures appears to play no important part in the occurrence of disease. Wheat is grown within two or three miles of the sea at Dongarra, and quite close throughout the Midland and Geraldton areas generally. Yet rust, though always present in unimportant quantities, is only of importance in the rare years of very wet springs followed by warm, cloudy or foggy weather.

Summer crops are dependent upon natural supplies of soil moisture, such as occur on river flats and in depressions supplied by soakage, or upon irrigation. To a lesser extent they may be grown on water retained in the soil by cultivation and fallowing. In these ways vegetables, fruits, and crops, such as lucerne, Sudan grass, sorghum and maize, etc., and early sown crops of oats, are able to be grown. The term "summer land" is used to indicate soils naturally well supplied with moisture in the summer. Such soils unless drained are usually more or less inundated in the winter, and are then useless for crops. When properly drained, cultivation is possible throughout the year. Irrigation is confined to a scheme at Harvey and to individual pumping or gravitational systems. In the goldfields area the cultivation of vegetables and gardens is rendered possible from the water from the Goldfields Water Supply. In the Metropolitan area, and where public water systems are available, these are used to a small extent for vegetable crops in the summer.

The low humidity is a great protection for summer crops against parasitic diseases of the above ground parts. This protection is less effective where spray irrigation is used, the wetting of the plants being probably the principal reason. There is

naturally not the same protection against diseases which attack plants at or below ground level.

The wet season with its two growing periods, the autumn and spring, is, in consequence of its high humidity, the season in which parasitic diseases are most important. As in one case the temperatures are falling and in the other rising, it naturally follows that serious occurrences of disease are most likely in wet seasons which open early or close late, so that high humidity coincides with relatively high temperatures. Again for the same reason epiphytotisms are more likely in the spring with rising temperatures and increasing development of the parasites than in the autumn with falling temperatures. Diseases which are normally spring-infecting such as Mildew of Grape (*Uncinula necator*), Black Spot of Grape (*Sphaceloma ampelina*), Scab of Pear (*Venturia pyrina*), Leaf Curl of peaches and nectarines (*Taphrina deformans*), etc., are to be expected in important occurrence whenever the wet season continues unusually late.

It appears probable that the occurrence of autumn-infecting diseases, such as Ball Smut (*Tilletia levis*), Take-all (*Ophiobolus graminis*), and Flag Smut (*Urocystis tritici*) are most likely to be serious with the occurrence of an early wet season. This is in accord with general experience, which indicates that these diseases are less likely to occur in seasons of late autumn rains.

The foregoing remarks do not apply to those diseases which are favoured by relatively low temperatures combined with high humidity. Such diseases may be serious from the autumn to spring. For instance, Brown Rot of orange (*Phytophthora sp.*) may start at any time in the wet season and reach its maximum development about August, coinciding with the ripening of the fruit.

Diseases of non-parasitic character occurring in the wet season are usually connected with water supply and low temperatures. The water-logging of soils is important in this direction, especially when followed by warm dry periods in which heavy soils set hard. Dry warm spells in winter may be responsible for the premature flowering of cereal crops, resulting in damage from drought or from subsequent rain or frosts. The occurrence of cold spells after the spring has commenced may also interfere with fruit setting, and appears to be associated with the occurrence of Sour Sap in apples and stone fruits.

In general it may be stated the crops in Western Australia, owing to the low summer humidity are very free from above ground parasitic diseases in the summer. The occurrence of such diseases as occur may be traced back to infection in the spring, during which time the resultant damage has its origin. It is probable that little infection or re-infection of plants occurs once the dry season has started.

Parasitic diseases more definitely developed in the spring or

autumn are not uncommon, but their important occurrence appears to be largely connected with unusual earliness or lateness of the wet season or the occurrence of muggy weather in the summer.

The occurrence of diseases due to pathogenic organisms, such as Fusarium spp., attacking from the soil is determined more by soil moisture than atmospheric humidity. Such diseases may occur at any time during warm weather.

Parasitic diseases favoured by cool moist weather find ideal conditions in the late autumn and winter and early spring months. Fortunately few in number, these diseases are frequently serious.

Storage diseases due to saprophytes and weak parasites such as *Fusarium*, *Alternaria*, *Macrosporium*, *Penicillium*, etc., are able to develop whenever the suitable moisture conditions are available. Temperatures, except in cool storage, are rarely low enough to stop their development, which is naturally greatest and most serious at high temperatures.

Diseases of a non-parasitic nature are in the main climatic in origin, being principally connected with moisture supplies and temperature, and evaporation due to wind and dry air. These troubles, together with those due to soil conditions, are to be foreseen to a large extent, and may be judiciously avoided or guarded against. Their occurrence is usually the outcome of the selection of unsuitable sites or the failure to arrange for the necessary moisture for summer crops, protection from wind, drainage, etc. This remark does not apply, of course, to troubles arising from unseasonable conditions.

Several important diseases occurring in the other Australian States are absent or rare. They are principally those requiring warm muggy conditions in spring and summer for their best development. Amongst those which are not known are Apple Scab (*Venturia inequalis*), and Downy Mildew of Grape (*Plasmopora viticola*). Amongst those that are rare are Irish Blight of potatoes (*Phytophthora infestans*), Wheat Rust (*Puccinia graminis*), and Brown Rot of stone fruits (*Monilia* sp.)

It is an interesting sidelight on the occurrence of these diseases that systematic spraying in orchards is limited to the winter and spring months. Summer spraying of fruits is almost unknown.

ISOLATION AS A FACTOR AFFECTING THE INTRODUCTION OF DISEASES.

The isolation of Western Australia by a wide belt of arid uncultivated country from the other States and from the North-West, has undoubtedly been of assistance in keeping out some of the parasitic diseases. It follows that all plants, seeds, etc.,

likely to convey diseases can only enter the State at relatively few points. The great bulk of imports come through Fremantle, the remainder through Albany and Kalgoorlie and per medium of the Post Office. Outside these usual channels in which all imports are subject to inspection, there remains only the danger of introduction in the personal baggage of travellers, via Fremantle, Albany, and Kalgoorlie.

LEGISLATION AND INSPECTION AS RELATED TO THE INTRODUCTION OF DISEASES.

Inspection of all plants, seeds, etc., both from abroad and from other States is carried out under either the Federal Quarantine Act or the State Plant Diseases Act. The scope of the latter in particular is very wide. Undoubtedly this inspection has been instrumental in checking many introductions of disease, particularly those of apples, the importation of which is wholly prohibited. Western Australia imports large quantities of seeds, including cereals, and also orchard plants. Very little is imported in the way of fruit, except dried and tropical fruits, but considerable imports are made of potatoes. The defects of inspection as a preventive against parasitic diseases are obvious. Many diseases cannot be recognised in a practical way on seeds, tubers or plants. Diseases known only in recent years in this State and probably introduced on seed include Downy Mildew (*Sclerospora macrospora*), and Flag Smut (*Urocystis tritici*) of wheat. The Plant Diseases Act provides ample power to deal with an outbreak of a new disease, but it is usually the case that the occurrence is not reported for several seasons, during which the disease becomes established and eradication becomes economically almost impossible.

Summary.—Western Australia is very free from parasitic diseases that are normally summer diseases. It is subject slightly to diseases which cause infection in the spring, but reach their obvious development in the summer. It is subject more seriously to diseases which are primarily of autumn, winter and spring occurrence, to diseases due to infection from the soil, and to those caused by organisms which thrive at low temperatures. It is also liable to a number of plant troubles from environmental conditions, especially those arising out of the climate. In short, plants in Western Australia are liable to parasitic diseases in the wet season and to non-parasitic troubles in the dry season.

PLANT DISEASES OF WESTERN AUSTRALIA.

In the following table—

Occurrence is indicated by—

V.C. = Very common.
C. = Common.
O. = Occasional, though found to some extent each year.
R. = Rare. Only occasional years.

Importance in cases of maximum attack noted.—

4. = Very serious, leading to crop failures, or serious wastage in products.
3. = Serious. Control treatment advisable.
2. = Not serious. Control treatment not usual.
1. = No economic importance.

Season of occurrence.—

W. = Wet season (April or May to September or October).
W (spring) indicates the period September-October or to conclusion of wet season.
D. = Dry season (October or November-March or April).

The first published record of the occurrence of a disease in Western Australia is indicated by the recorder's name and date of publication as shown in the Bibliography attached.

The table is compiled on a host basis. Exotic plants are grouped; native plants are in alphabetical order of botanical names.

FRUIT AND FRUIT TREES.

POME FRUITS.

(Apple, Pear, and Quince.)

Mildew. *Podosphaera oxyacanthae* (DC) De Bary. VC. 3. W (spring). Despeissis 1901, on apples. Occurs also on pears. Apple varieties most affected are Northern Spy, Rome Beauty, and Cleopatra.

Pear Scab or Black Spot. *Venturia pyrina* Aderh. VC. 3-4. W (spring) & D. McAlpine 1895.

Root Rot. *Armillaria mellea* (Vahl) Quel. O. 3-4. W & D. Found principally where the trees were planted after clearing green timber, especially on land which had carried Marri (Eucalyptus calophylla).

Stem Canker. *Diplodia* sp. Causes a twig dieback and cankering of stems of apples and pears. Not known on fruit. Recorded only from Capel from a non-commercial orchard. Carne 1924.

Blister Canker. Associated with *Coniothecium* sp. C. 1-4. W & D. Carne 1924. On apple and pear trees, particularly those affected with fruit cracking. Twigs die back. Bark of stems develops large blistered areas. Probably physiological in origin. Locally known as Fire Blight. Dieback is most marked on pear trees on Darling Range. Leaves appear burnt.

Fruit Russetting and Cracking. Frequently associated with *Coniothecium* sp. O-C. 1-4. W (spring) & D. Carne 1924. Probably physiological in origin and varies with the seasons. Bad 1923-24 with an early dry season. Rare 1924-25 with a late and cool summer. Locally known as Scab. Dunns, Pippins, Rokewood, and other hard varieties of apples are very subject. Pears are usually less affected.

Fruit-Cracking Non-parasitic. O. 3-4. D. Due to effects of summer or unusually early autumn rains on ripening fruit.

Bitter Pit, Crinkle, Pig Face. Non-parasitic. O-VC. 3-4. D. McAlpine 1912. On apples and pears. Varies considerably from season to season. Occurred badly during 1923-24 season, which was characterised by hot days and cool nights. Varieties most affected are Cleopatra, Cox's, Jonathan, Rome Beauty, etc. Occurs also as a cold storage and shipping trouble. The 1923-24 season was one of the worst known for this disease, as well as the driest summer on record. It is interesting to note the temperatures* recorded at two of the principal apple-growing centres:—

	Bridgetown.			Mt. Barker.		
	Min.	Max.	Greatest daily range.	Min.	Max.	Greatest daily range.
1923.						
December	39.0	94.5	47.3 ..	41.0	91.0	39.1
1924.						
January	37.0	102.0	52.0 ..	40.0	102.0	45.0
February	37.5	96.5	49.0 ..	44.1	99.8	42.7
March	35.0	91.0	52.5 ..	44.8	93.0	36.7
April	35.0	95.0	53.0 ..	43.0	90.0	29.7

Jonathan Spot. Non-parasitic. O. 3. D. Though infrequent on trees, is very common on stored Jonathans, occasionally on other varieties such as Rome Beauty.

Sour Sap. Non-parasitic. O. 3-4. W (spring). Varies considerably with the seasons and is very local in occurrence. Appears to be favoured by a season when a cold spell occurs after spring growth has commenced, especially in moist situations.

Brown Heart. Non-parasitic. Known principally as a ship-

* Kindly supplied by Mr. E. B. Curlewis, Officer-in-Charge, Commonwealth Meteorological Bureau, Perth.

ping and cold storage trouble. Varies considerably with different shipments. Not reported as occurring in shipments in 1924.

Internal Breakdown. Non-parasitic. Cold storage trouble.

Scald. Non-parasitic. Cold storage trouble.

Water or Glassy Core. Non-parasitic. O. 1. D. Varieties principally affected are Stone Pippin, Dunn and Rokewood.

Mouldy Core. Saprophytic fungi? O. 1. D. Common in varieties with open calyx-ends, as Cleopatra.

Chlorosis. Non-parasitic. C. 1. D. Jonathans are especially subject.

STONE FRUITS.

(Peach, Plum, Apricot, Cherry, Almond, Nectarine.)

Leaf Curl of Peach and Nectarine. *Taphrina deformans* (Fel) Tul. VC. 3-4 W (spring). McAlpine 1895. Varieties of peaches most affected are Elberta, Lady Palmerston and China Flat. The disease occurs occasionally on nectarine fruits.

Rust. *Puccinia pruni-spinosae* Pers. VC. 1. D. McAlpine 1895. Occurs in summer and late autumn on leaves and very rarely on fruit. Royal George is probably the most affected peach. Fruit attack is practically confined to late seedlings. Peach, almond and plum attacked.

Apricot Blossom Wilt and Dieback. *Monilia* sp. R. 34. W. (spring). Known only from one locality in Upper Swan.

Root Rot. *Armillaria mellea* (Vahl) Quel. O. 3-4. W and D. See note under Pome Fruits.

Shot Hole. *Phyllosticta circumcissa* Cke. O. 2. D. McAlpine 1895.

Shot Hole or Dieback. *Clasterosporium carpophilum* (Lev) Aderh. C-VC. 2-4. W (spring) & D. Bad on apricots, but especially so on almonds in the coastal districts. Less common on peach and plum.

Sour Sap. Non-parasitic. O. 4. W (spring). Jnl. Bur. Agr. W.A. 1896, p. 1027 and p. 1049. Seasonal variation particularly marked in stone fruits. See also note under Pome fruits.

Gummosis. Non-parasitic? O. 2-4 D. Serious on cherries.

Jap. Plum Deformity or Crinkle. Non-parasitic. O. 3. D. Found principally on Kelsey plums. Causes depressed firm irregular areas resembling confluent Bitter Pit in apples. Tissue firm and dark, but not dry as in apples.

CITRUS FRUITS.

(Orange, Lemon, Mandarin, Grapefruit.)

Australian Brown Rot of Orange. *Phytophthora* sp. C. 4. W. Carne 1924. This disease is widely spread, but is much more serious in the Darling Range orchards than on the coastal plain. Causes also a leaf blight.

Australian Lemon Brown Rot. *Phytophthora* sp. C. 4. W. Carne 1924.

Lemon Leaf Blight (caused by an unidentified Phycomycete). C. 4. W. Carne 1924.

Sooty Mould. *Capnodium citricolum* McAlp. C. 3. D. McAlpine 1899. Closely associated with the occurrence of Lecanium Scales and Aphides.

Root Rot. *Armillaria mellea* (Vahl.) Quel. O. 3-4. W. & D. J. S. Jefferson 1907. Citrus trees are very subject to attack. See note under Pome fruits.

Withertip or Dieback. *Phoma omnivora* McAlp. W. & D.. McAlpine 1899.

Withertip or Dieback. Associated with *Colletotrichum gloeosporoides* Penz. VC. W or D. Fungus always to be found on sickly branches or leaves. Associated with, but probably not an original cause of Dieback. Also occurs as a storage disease of fruit occurring with *Penicillium* spp. following Brown Rots. Common on stem nipples on stored fruit.

Scurf of Fruits. Associated with *Sporodesmium* sp. VC. ?. W. & D. This fungus is usually associated with scurf on citrus fruits, but appears in the main to be secondary to skin injuries due to scratches, rubbing, insect bites, etc. Probably enlarges the affected area.

Black Rot. *Cladosporium* sp. C. W. Secondary. Common on lemons with Brown and Sour Rots. Less common on oranges with Brown Rot, etc.

Botrytis Rot. *Botrytis cinerea* Pers. Recorded from Harvey only. O. 4. W.

Other Rots. *Alternaria* sp. and *Fusarium* sp. O. ?. W. Occasionally associated with other rots of citrus fruit.

Blue and Green Moulds. *Penicillium italicum* Weh. and *P. digitatum* (Fr.) Sacc. VC. 4. W. The most serious storage disease following injury to fruit, Brown Rot, etc. Occurs on fruit on trees, but principally on soil or in packing sheds and stores.

Sour Rot or Watery Rot of Lemons. *Oospora citri-aurantii* (Ferr). Sacc. and Syd. VC. 4. W. Very common on lemons

affected with Brown Rot. Probably always secondary. Fruit rots on trees or in store, producing a soft greasy watery rot with a characteristic acid smell. The fruit develops a straw colour, and is very liable to split open. Has been found associated with Brown Rot on oranges occasionally.

Leaf Spot. *Septoria Westraliensis* McAlpine. Recorded by McAlpine, 1899. Not seen by writer.

Collar Rot. ?*Fusarium limonis* Bri. O. 2. W & D. Occurs in wet and badly drained spots, and especially on lemons.

Exanthema. Non-parasitic. C. 4. W. Especially on light and gravelly soils.

Mottled Leaf. Non-parasitic. C. 1. D & W. Generally regarded as evidence of nutritive troubles.

Leaf Scab or Greasy Spot. Non-parasitic. O. 1. D & W.

Stem-end Spot. O. 3. W. Non-parasitic. Occurs on Oranges, especially Navels, kept too long after picking.

Crinkle of Orange. Non-parasitic. O-C. 1-2. This name is applied to the cracking of the pithy portion of the skin resulting in depressions on the surface. The quarters are sometimes ruptured and cells protruded into the cracks. May lead to splitting in cased oranges. When oranges split on the trees after summer rains the ruptures tend to follow the crinkles. Occurrence varies considerably with the seasons. Appears to be worst in orchards which have become dry from lack of sufficient summer irrigation.

Fruit Splitting. O-C. 4. D. Due principally to summer rains after the dry season has become well advanced.

GRAPES.

Powdery Mildew or Oidium. *Uncinula necator* (Schw.) Burr. Perithecia not seen. VC. 3-4. W (spring). McAlpine 1895.

Anthracnose, Black Spot. *Sphaceloma ampelinum* De Bary. VC. 3-4. W (spring) and D. McAlpine, 1895. Principally in the coastal districts. The newer inland vineyards are free from this disease.

Root Rot. *Armillaria mellea* (Vahl) Quel. O. 3. W & D. See note under Pome Fruits.

Court-Noue. Non-parasitic. O. 4. W. (spring). In limited areas in Swan and Spearwood districts. Severity varies with the seasons. Cause unknown.

Coulure or Shedding. Non-parasitic. Varies with seasonal conditions.

Chlorosis. Non-parasitic. C. — D.

Sun Scald. Non-parasitic. O. 1-2. D. Varies in importance with the seasons.

Lightning Injury. R. —. D. Two cases recorded in the Swan district.

Fruit Splitting. Varies with season. Associated with the occurrence of summer rains when fruit is ripening. Followed by moulds.

MISCELLANEOUS FRUITS.

Fig: Leaf Mottle, Fruit Splitting and Dropping. Cause unknown, probably due to soil moisture conditions. VC. 2-4. W.D.

Fig: Eelworm. O. W & D. Common around Perth and Fremantle, on sandy soils.

Loquat: Anthracnose. *Fusicladium eriobotryae* Cav. VC. 3 W. (spring). Despeissis, 1901.

Mulberry: Root Rot. *Armillaria mellea* (Vahl) Quel. O. 3. W & D. See note under Pome Fruits.

Mulberry Leaf Spot. *Bacillus mori* B. & L.? O. 3-4. D. Fairly common on edible mulberries around Perth.

Passion Fruit: Root Rot. *Armillaria mellea* (Vahl) Quel. O. 3. W & D.

Passion Fruit: Brown Spot. *Glocosporium fructigenum* Berk. Recorded only from Coolup, 1924.

Passion Fruit: Eelworm. *Heterodera radicicola* O. D.

Strawberry: Mildew. *Sphaerotheca humuli* (D.C.) Burr. O. 2. W.

Strawberry: Leaf Spot. *Mycosphaerella fragariae* (Schw.) Lind. VC. 2. D. McAlpine, 1895.

VEGETABLE CROPS.

Potato.

Black Leg. *Bacillus atrosepticus* Vann Hall. O. 2. W. (spring). Herbert, 1920.

Bacteriosis. Bacterial Wilt. *Bacillus solanacearum* E.F. Sm. O. 2-3. W & D (spring). Herbert, 1920.

Wet Rot. *Bacillus* spp. O. 3-4. W & D. Rotting of tubers after harvesting. Most serious in autumn crop when early autumn rains in swamp land makes harvesting in wet soils necessary.

Scab. *Actinomyces scabies* (Thax.) Gussow. V.C. 3. W & D. Helms, 1898. Principally in summer crops in heavy sour soil which is waterlogged in winter.

Irish Blight. *Phytophthora infestans* (Mont) De Bary. R. 4. W (spring). McAlpine, 1911. No serious damage since 1918.

Rhizoctonia Scab. *Corticium vagum* B. & C. var. solani Ber. C. 2-3. W & D. McAlpine, 1911.

Root Rot. *Armillaria mellea* (Vahl.) Quel. R. 1. D & W. See note under Pome Fruits.

Silver Scurf or Storage Trouble. *Spondylocladium atrovirens* Harz. C. 2-3. W & D (spring and autumn). Noticeable principally on stored potatoes.

Early Blight. *Alternaria solani* (E and M) Jones and Grout. O. 2-3. W (spring). Herbert, 1920. Fairly common in June planted crops.

Wilt, Dry Rot or Brown Ring. *Fusarium* (*oxysporum* Schl.?) O. 2. W & D. Herbert, 1920.

Storage Rot. *Fusarium* sp. C. 3. W & D. Common on injured and diseased tubers.

Eelworm. *Heterodera radicicola* (Greef) Mull. O. 2-3. D. Newman, 1920. Localised in various places. Prevalent on irrigated crops at Hamel. Not known in more important potato areas.

Hollow Heart. Non-parasitic. R. 1. D & W. Herbert, 1920.

Black Heart. Non-parasitic. R. 4. A storage trouble due to lack of ventilation.

Brown Fleck. Non-parasitic. R. 2. D. Herbert, 1920. Principally in irrigated crops.

Thready Eye. Non-parasitic. R. 4. D. Herbert, 1920. Principally in Albany district in April dug crop.

TOMATO.

Bacteriosis or Bacterial Wilt. *Bacillus solanacearum.* E.F. Sm. O. 4. D.

Leaf Spot. *Septoria lycopersici* Speg. C. 2. D. On early crops only.

Early Blight. *Alternaria solani* (E & M.) Jones and Grout. C. 2. D. On early crops only.

Blossom-end Rot or Black Spot. Non-parasitic, associated with *Alternaria* sp., etc. C. 4. D. On dry soils, especially sand and heavy clays. Chalks Early Jewel particularly subject.

Sleepy Sickness or Wilt. *Fusarium lycopersici* Sacc. O. 4. D. Carne, 1923 (Bulletin on Spotted Wilt).

Eelworm. *Heterodera radicicola* (Greef) Mull. O. 2. D. On dry sandy soils.

Spotted Wilt or Tomato Disease. VC. 4. W & D. Cause unknown. Has severely affected the commercial growing of early tomatoes, and has completely prohibited that crop around Perth. The late summer and autumn crops are much less but still seriously affected. Northern and inland districts are relatively free, but of these only Geraldton produces early tomatoes in commercial quantities. Carne, 1923.

Sunburn of Fruit. Non-parasitic. O. 2-3. D. On dry soils particularly.

Rosette or Hen and Chickens. Non-parasitic. O. 4. D.

BEANS.

Broad, French and Runner.

Anthracnose of French Beans. *Glomerella lindemuthianum* Shear. C. 2. D. Despeissis, 1901.

Rust of Broad Bean. *Uromyces fabae* (Pers) De Bary. C. 1. W.

Red Leaf Blotch of Broad Bean. Cause unknown. C. 2. W.

PEAS.

Mildew. *Peronospora viciae* Berk. Recorded only from Beverley, October, 1924.

Leaf Spot. *Mycosphaerella pinodes* (Berk & Blox) Lind. O. 2. W.

Eelworm. *Heterodera radicicola* (Greef) Mull. C. 2-3. Usually associated with dry soils in the autumn.

BEETS AND MANGOLDS.

Heart Rot. *Mycosphaerella tabifica* (Prill & Del.) Johns. C. 2. W.

Leaf Spot. *Cercospora beticola* Sacc. C. 1. W.

Rust. *Uromyces betae* (Pers) Kuehn. O. 1. W.

Eelworm. *Heterodera radicicola* (Greef) Mull. C. 2-3. D. Important only at the end of summer in drying soils.

CELERY.

Late Blight. *Septoria petroselini* Desm. var. apii Br. & Cav. VC. 3-4. W (spring) & D. Principally in spring crop. Occurs to a lesser extent in autumn and late summer. Grown on drained swamp lands.

CARROT AND PARSNIP.

Eelworm. *Heterodera radicicola* (Greef) Mull. C. 3. D. May be bad at the end of summer if the soil dries out.

CABBAGE, CAULIFLOWER, SWEDE, TURNIP, Etc.

Club Root. *Plasmodiophora brassicae* Wor. R. 2. D.

Black Rot of Cabbage and Cauliflower. *?Pseudomonas campestris* Pam. O. 3-4. D & W. Autumn and Spring.

Ring Spot of Cabbage and Cauliflower. *Mycosphaerella brassicicola* (Duby) Lind. C. 2. W.

Black Leg of Cabbage and Cauliflower. *Phoma brassicae* Thuem. Found near Fremantle in autumn, 1924, associated with Black Rot.

Eelworm. *Heterodera radicicola* (Greef) Mull. O. 2. D. Autumn and spring.

MELON, PUMPKIN, SQUASH, CUCUMBER, Etc.

Mildew. *Erysiphe cichoracearum* DC. VC. 2-4. D.

Anthracnose. *Gloeosporium* sp. O. 2-3. D.

Tip Rot of Fruit. Non-parasitic. C. 2. D.

Eelworm. *Heterodera radicicola* (Greef) Mull. O. 3. D.

ONION, LEEK AND SHALLOT.

Mildew. *Peronospora schleideni* Ung. VC. 2. W (spring) & D. Usually appears as crops are maturing. Herbert, 1919.

Red Root. *Fusarium* sp. (*?F. malli* Taub). VC. 3. W. Mainly around Spearwood, the principal onion district. Becomes most noticeable in spring, but occurs in seed beds in autumn. Herbert, 1921, without identification of parasite.

Bulb Rot. *Fusarium* sp. Recorded from Peel Estate and Hamel, August and September, 1924.

Eelworm. *Heterodera radicicola* (Greef) Mull. O. 1. D.

RHUBARB.

Crown Rot. *Phytophthora* sp. O. 4. D.

Root Rot. *Armillaria mellea* (Vahl) Quel. O. 3.

Rust. *Puccinia phragmites* (Schum) Koern. VC. 1. D & W.

Leaf Spot. *Phyllosticta* sp. C. 2. D & W.

Eelworm. *Heterodera radicicola* (Greef) Mull. O. 2.

CEREAL DISEASES.

WHEAT.

Downy Mildew. *Sclerospora macrospora* Sacc. Carne, 1924 (b). R. 3. W. Recorded from wet places at Three Springs, 1923, Nembudding and Bruce Rock, 1924.

Mildew. *Erysiphe graminis* DC. O. 1-2. W. Sutton, 1920 (a). See Carne and Campbell, 1924 (b).

Black Mould. *Mycosphaerella tulasnei* Jacz and *Alternaria* sp. C. 1-2. W. When crops are ripening off, especially in moister districts, e.g., Victoria district. Carne and Campbell, 1924 (b).

Take-all. *Ophiobolus cariceti* (Berk and Br.) Sacc. O-C. 3-4. W. Sutton, 1920 (a). See Carne and Campbell, 1924 (a).

Loose Smut. *Ustilago tritici* (Pers) Rost. O-C. 2. W. Sutton, 1920 (b).

Ball Smut or Bunt. *Tilletia levis* Kuehn. VC. 3-4. W. See Carne, 1925 (a).

Ball Smut or Bunt. *Tilletia tritici* (Bjerk) Wint. Recorded by McAlpine, 1910. Apparently rare. See Carne, 1925 (a).

Flag Smut. *Urocystis tritici* Koern. O. 3. W. Carne 1924 (a). Confined at present to the Eastern Wheat Belt. See also Carne, Smut Diseases, 1925.

Stem Rust. *Puccinia graminis* Pers var. *tritici.* Carne and Campbell, 1924 (c). R. 4. W. Found in unimportant amounts in Northampton-Geraldton-Midland areas most years, and to a lesser extent in the Eastern Wheat Belt. Rarely epidemic. The last year of serious occurrence was in 1917. That year was characterised in the area affected by exceptionally heavy rainfall in July, August, September and October. These months were exceptionally cloudy and dull and much below the average in temperature. In October the rains ceased, and were followed by warm days and fogs. Mr. W. Waterhouse, of Sydney University

has examined rust specimens from this district, and states that all belong to his Biologic Form. 1.* Recorded by Helms, 1900.

Leaf Rust. *Puccinia triticina* Eriks. Recorded by McAlpine, 1906. Not seen by author.

Take-all (associated with *Wojnowicia graminis* (McAlp.) Sacc and D. Sacc.) Seen only from Quairading, February, 1924, associated with *Ophiobolus cariceti.*

Leaf Spot. *Septoria gramineum* Desm. VC. 1. W. Carne and Campbell, 1924 (b).

Dry Blight or Septoria. *Septoria nodorum* Berk. O. 2-3. W. Carne and Campbell, 1924 (b).

Ear-Cockle. *Tylenchus tritici* (Stein) Vast. O. 3. W. Helms, 1898.

Whiteheads. O. 4. W. Due to too early planting or unfavourable conditions, such as salt soils, drought, frost, or dry winds at flowering time. Carne and Campbell, 1924 (a).

BARLEY.

Mildew. *Erysiphe graminis* D.C. O. 1-2. W. Carne and Campbell, 1924 (b).

Naked Smut. *Ustilago nuda* (Jens) K & S. O. 1-2. W. Sutton, 1920 (b).

Covered Smut. *Ustilago hordei* (Pers) K & S. O. 1-2. W. Sutton, 1920 (b).

Leaf Spot. *Septoria (? passerinii* Sacc). O. 1. W. Carne and Campbell, 1924 (b).

Leaf Stripe. *Helminthosporium gramineum* (Rab) Erik. VC. 1-2. W. Carne and Campbell, 1924 (b).

Black Mould. *Mycosphaerella tulasnei* Jacz. OC. 1-2. W. On maturing crops in moister districts. Carne and Campbell, 1924 (b).

OATS AND BLACK OATS (Avena fatua).

Mildew. *Erysiphe graminis* DC. O. 1. W. Carne and Campbell, 1924 (b).

Black Mould. *Mycosphaerella tulasnei* Jacz. OC. 1-2. W. Common in moister districts. Carne and Campbell, 1924 (b).

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* From an unpublished paper, "Notes on Rust Investigations in Progress," W. L. Waterhouse, B.Sc. Agr., read before Pan Pacific Conference at Sydney, 1923.

Leaf Spot. *Leptosphaeria avenaria* Weber. O. 1. W. Carne and Campbell, 1924 (b).

Covered Smut. *Ustilago levis* (K & S) Magn. VC. 2. W. Not seen on Black Oats.

Loose Smut. *Ustilago avenae* (Pers) Jens. O. 2. W. McAlpine, 1910.

Stem Rust. *Puccinia graminis* Pers var. *avenae*. O. 2. W. Carne and Campbell, 1924 (c).

Leaf Rust. *Puccinia coronata* Cda. O-C. 2. W. Common in moister districts. Carne and Campbell, 1924 (c).

RYE.

Stem Rust. *Puccinia graminis*. R. —. W. Recorded only from Merredin, 1924.

MISCELLANEOUS ECONOMIC PLANTS.

LUCERNE.

Leaf Spot. *Pseudopeziza medicaginis* (Lib) Sacc. VC. 2. D.

Rust. *Uromyces medicaginis* Pass. O. 2. D.

TOBACCO.

Eelworm. *Heterodera radicicola* (Greef) Mull.

MISCELLANEOUS EXOTIC PLANTS (NOT CROP PLANTS).

CARNATION.

Rust. *Uromyces caryophyllinus* (Schw.) Wint. O. 3. W.

Leaf Spot. *Septoria dianthi* Desm. Maylands, 1924.

Leaf Mould. *Heterosporium echinulatum* (Berk) Cke. Belmont, 1924.

CHRYSANTHEMUM.

Mildew. *Erysiphe cichoracearum* DC. O. 3. W.

Malformation of Flowers. Non-parasitic. Due to nutrition troubles of forced plants.

GERANIUM (Pelargonium zonale).

Rust. *Puccinia Morrisoni* McAlp. O-VC. 2-3. W & D. Very common around Perth and near coast.

GRASSES.

Avena fatua L. See under Oats.

Bromus maximus L. Perth, 1923 and 1924.
Rust. *Puccinia bromina* Eriks.

Bromus unioloides. H. Br. K. Manjimup, etc., in sown pastures, 1924.

Bromus mollis L. Mt. Barker, 1924.
Smut. *Ustilago bromivora* (Tul.) F.v.W.

Cynodon dactylon Rich.
Smut. *Ustilago cynodontis* P. Henn. Common around Perth.

Holcus lanatus L.
Rust. *Puccinia coronata* Cda. Common in coastal districts from Perth southward.

Hordeum murinum L.
Stripe Disease. *Helminthosporium gramineum* Erik (Rab). Carne and Campbell, 1924 (b).

Panicum crusgalli L.
Smut. *Cintractia crus-galli.* Mag. Wanneroo, 1922.

Poa annua L.
Rust. *Puccinia poarum* Niels R. Around Perth.

Grass Lawns.
Physarum cinereum (Batch) Pers. A saprophyte. O. W. On lawns of Stenotaphrum dimidiatum and Cynodon dactylon around Perth.

Lysurus gardneri Berk. A saprophyte. O. W. Autumn, especially on Stenotaphrum dimidatum lawns. Herbert, 1919-20.

Hollyhock.
Rust. *Puccinia malvacearum* Mont. VC. W & D. Common around Perth.

Lavatera trimestris L.
Rust. *Puccinia malvacearum* Mont. South Perth. 1924.

Malva parviflora L.
Rust. *Puccinia malvacearum* Mont. VC. W & D. Does not appear to exercise any control over this weed. Common around Perth.

Phlox Perennial.
Septoria sp. Perth, 1924.

Rose.
Mildew. *Sphaerotheca pannosa* (Wallr.) Lev. VC. 3-4. W. & D.

Black Spot. *Actinonema rosae* (Lib.) Fr. O. 2-3. W & D.

Shepherds Purse. (*Capsella bursa-pastoris*).
White Rust. *Albugo candida* (Pers.) Rouss. O. W.

Sunflower.
Rust. *Puccinia helianthii* Schw. C. D. Perth. Herbert. 1920-21. Common around Perth.

Trefoil (*Medicago denticulata*).
Leaf Spot. *Pseudopeziza medicaginis* (Lib.) Sacc. W. (spring). Bickley, 1923.

NATIVE PLANTS.

Acacia acuminata. Benth. Wongan Hills, 1924, and Muresk, 1925.

A. cyclopis. A. Cunn. Swan River, 1924.

A. cyanophylla. Lindl. Gingin and Kelmscott, 1924.

A. erioclada. Benth. McAlpine, 1906.

A. glauceptera. Benth. McAlpine, 1906.

A. ligustrina. Meissn. Wongan Hills, 1924.
Gall Rust. *Uromycladium Tepperianum* (Sacc) McAlp.

Acacia extensa. Lindl. Cheel, 1911.
Gall Rust. *Uromycladium* sp.

Acacia spp.
Armillaria mellea (Vahl) Quel. Collie, 1924.

Arundo sp.
Coniosporum inquinans Dur and Mont. McAlpine, 1895.

Boronia juncea Bart.
Sphaeropsis boroniae P. Henn. Perth. Hennings, 1901.

Boronia spinescens Benth.
Puccinia boroniae P. Henn. Avon. Hennings, 1903.

Bossiaea linophylla, R. Br.
Aecidium eburneum McAlpine. King George's Sound. McAlpine, 1906.

Bromus arenarius Labill.
Ustilago bromivora Wall. Tammin, Cheel, 1910.
Puccinia bromivora Eriks. Wongan Hills, 1904.

Burchardia umbellata R. Br.
Puccinia Burchardiae Sacc. Perth, 1915.

Conostylis aurea Link.
Puccinia haemodori P. Henn. Perth. Cheel, 1909.

Dampiera leptoclada Benth. Albany. Cheel, 1909.

D. spicigera Benth. Murchison R. Cheel, 1909.

D. alata Lindl. Perth. McAlpine, 1906.
Puccinia dampierae Syd.

Eucalyptus diversicolor F & M.
Xylostroma gigantea Fries. Big Brook. Herbert, 1919-20.

Eucalyptus spp, especially E. calophylla R. Br. Common.
Armillaria mellea (Vahl) Quel. Bibra Lake, etc., 1923, but apparently does not affect trees.

Gastrolobium spinosum Benth.
Lizonia oxylobii P. Henn. Perth. Hennings, 1901.

Grevillea sp.
Phyllachora grevilleae Sacc. McAlpine, 1895.

Haemodorum sp.
Puccinia haemodori P. Henn. Perth. Hennings, 1901.

Hakea glabella R. Br. Herbert, 1919-20.

Hakea sp. Thuemen, 1878.
Uredo angiosperma Thuem.

Jacksonia macrocalyx Meissn.
Pestalozzia jacksoniae P. Henn. Perth. Hennings, 1901.

Jacksonia sternbergiana Heug.
Cronartium jacksoniae P. Henn. Perth. Cheel, 1910.

Juncus pallidus R. Br.
Tolysporium juncophilum McAlpine. Mt. Barker. McAlpine, 1900.

Leucopogon hispidus Pritzel.
Lizonia singularis P. Henn. Mingenew. Hennings, 1903.

Leschenaultia linarioides DC.
Puccinia gilgiana P. Henn. (including *Aecidium Perkensiae* P. Henn). Perth. Hennings, 1901.

Oxylobium lineare Benth.
Lizonia oxylobii P. Henn. Perth. Hennings, 1901.

Pelargonium australe Wield.
Puccinia Morrisoni McAlpine. Cowcowing. Cheel, 1909.

Persoonia elliptica R. Br.
Hendersonia persooniae P. Henn. Perth. Hennings, 1901.

Piperomia sp.
Eurotium lateritium Mont. McAlpine, 1895.

Synaphea polymorpha R. Br.
Dimerosproium synapheae P. Henn. Perth. Hennings, 1901.

Threlkeldia drupata Diels.
Puccinia Dielsiana P. Henn. Perth. Hennings, 1901.

Tremandra stelligera R. Br.
Puccinia Pritzeliana P. Henn. Perth. Hennings, 1901.

Xylomelum occidentalis R. Br.
Physalospora xylomeli P. Henn. Perth. Hennings, 1901.

PHANEROGAMIC PARASITES.

Cuscuta epithymum L.—O. 3. W. Recorded only on Trifolium subterraneum.

Loranthus spp.— Various species and their hosts are recorded by W. F. Blakeley in Proceedings of Linnean Society of N.S.W., commencing Vol. XLVII., 1922, and still being published.

Nuytsia floribunda R. Br.— On roots of citrus, broad beans, carrot, rose, grape, Cytisus proliferus, Rumex acetosella, Cynodon dactylon, Pelargonium zonale, Solanum nigrum var., Hibbertia hypericoides, Banksia attenuata, B. Menziesii, Simsia latifolia, Melaleuca Huegelii, M. viminea, Conostephium pendulum, Jacksonia furcellata, Calythrix flavescens, Acacia pulchella. D. A. Herbert, Pro. Royal Soc. W.A., V. 1918-19, p. 72. On roots of Casuarina humilis. Unpublished record by C. A. Gardner. On roots of Pinus radiata. Ludlow, 1925.

Fusanus spicatus R. Br.— On roots of Acacia acuminata, A. aneura, A. craspedocarpa, A. doratoxylon, A. microbotrya, A. Oswaldi, A. signata, Cassia eremophila, C. artemisioides, Templetonia retusa, Casuarina campestris, C. Huegeliana, Dodonaea attenuata, D. attenuata var. linearis, D. filifolia, D. inaequifolia, D. lobulata, Eremophila Goodwinii, E. Oldfieldii, E. Dempsteri, E. Paisleyi, E. oppositifolia, E. scoparia, Hakea commutata, H. recurva, Melaleuca uncinata, Kochia sp. D. A. Herbert and C. A. Gardner. Proc. Roy. Soc. W.A., 1920, p. 77, and unpublished records by C. A. Gardner.

Fusanus acuminatus R. Br.— On roots of Acacia acuminata, Templetonia sulcata (recorded in error as Daviesia euphorbioides), and Eucalyptus loxophleba. D. A. Herbert. Proc. Roy. Soc. W.A., Vol. 7, 1920-1, page 75.

Santalum lanceolatum R. Br.—On roots of Acacia tanumbirinense, Ficus leucotricha, and Bauhinia Cunninghamii. C. A. Gardner. W.A. Forests Department Bulletin, No. 32, pp. 45.

Exocarpus latifolia R. Br.— On roots of Petalostigma quadriloculare, Canthium attenuatum, Terminalia circumalata, Callitris intratropica. C. A. Gardner, W.A. Forests Dept. Bulletin, No. 32, p. 45.

Exocarpus aphylla R. Br.— On roots of Templetonia sulcata. Unpublished record by C. A. Gardner.

Exocarpus spartea R. Br.— On roots of Eucalyptus Oldfieldii. Unpublished record by C. A. Gardner..

Choretrum lateriflorum R. Br.—On roots of Acacia pentadenia. Unpublished record by C. A. Gardner.

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